

BOTANICAL MUSEUM LEAFLETS

HARVARD UNIVERSITY

CAMBRIDGE, MASSACHUSETTS, JULY 6, 1953

VOL. 16, No. 5

NOTES ON THE CULTIVATED LULO

BY

RICHARD EVANS SCHULTES¹ AND JOSÉ CUATRECASAS²

ONE of the most delicious of those cultivated fruits peculiar to the northern Andes is the *lulo* or *naranjillo*. This fruit is very common from Perú and Ecuador to northern Colombia and Venezuela. Its area of greatest production centers probably in Ecuador and southern Colombia.

In spite of the fact that a number of articles on this economic fruit have recently appeared (Pérez-Arbeláez, "Plantas medicinales y venenosas de Colombia" (1937) 246; Chalons in *Agric. Amer.* 4 (1944) 110-112; McCann, *ibid.* 7 (1947) 146-149; Hodge in *Rev. Fac. Nac. Agron.* 7 (1947) 147-154; Hodge in *Journ. N.Y. Bot. Gard.* 48 (1947) 155-159; Pérez-Arbeláez, "Plantas útiles de Colombia" (1947) 451), little of a detailed nature has been known about the taxonomy of the source-plant. Although it has been generally accepted that the lulo represented *Solanum quitoense*, there is sufficient variation between the lulo plants from different parts of Colombia to raise some doubt that only one species is

¹ Botanist, Division of Rubber Plant Investigations, Bureau of Plant Industry, Soils, and Agricultural Engineering, Agricultural Research Administration, U. S. Department of Agriculture; Research Fellow, Botanical Museum of Harvard University.

² Curator of Colombian Botany, Chicago Natural History Museum.

involved (Schultes in Bot. Mus. Leafl. Harvard Univ. 14 (1949) 45, t. 10).

We have recently attempted to study the numerous specimens of lulo now available. Although many more field observations and much more material from a wider area are greatly to be desired, we believe that our studies have led to at least a preliminary clarification of the problem. It is merely as a preliminary contribution that we offer the following notes.

Both of us have seen the lulo under cultivation in the field. Our experience and field notes are in complete agreement with the results of our study of the available herbarium material.

We wish to thank the Directors of the following botanical institutions for their kindness in allowing us to consult the material entrusted to their care: Gray Herbarium, Arnold Arboretum, Economic Herbarium of Oakes Ames (Harvard University); Chicago Natural History Museum; National Arboretum Herbarium (Beltsville, Maryland); U. S. National Herbarium (Washington, D.C.); Royal Botanic Gardens (Kew); British Museum (Natural History) (London); Musée d'Histoire Naturelle (Paris); Jardin Botanique de l'Etat (Brussels); Jardin Botanique (Geneva); and the Jardín Botánico (Madrid).

The two concepts which are involved may be distinguished by the character in this key.

I. Planta perfecte inermis. Peruvia, Ecuadore, Colombia meridionali.

Solanum quitoense

II. Planta ramulis, petiolis, nervisque variabiliter armata, Colombia centrali et septentrionali.

Solanum quitoense var. *septentrionale*

Solanum quitoense *Lamarck* Illustr. 2 (1797) 16.

Solanum angulatum Ruiz & Pavón Fl. Peruv. 2 (1799) 36, t. 170, fig. a.

Solanum quitense Humboldt, Bonpland & Kunth Nov. Gen. et Sp. 3 (1818) 25.

COLOMBIA: No definite locality. 1842, *Sinclair s.n.*—Comisaría del Putumayo. Valley of Sibundoy, Sibundoy. Alt. about 2225–2300 m. February 16, 1942, *R. E. Schultes 3271.*—Same locality. “Large shrub. Stem and under surface of leaf purplish, hairy. Flowers white, anthers yellow. Fruit orange coloured and size of oranges. *Naranjillo*. Kamsá Indian name: *ma-sha-kve.*” May 29, 1946, *R. E. Schultes & M. Villarreal 7616.*

ECUADOR: No definite locality. “Nuqui.” January 1848, *Seemann s.n.*—Guayaquil. [Cultivated from seed collected in Chimbo.] November 27, 1897, *J. V. S. Muller s.n.*—Vicinity of Huigra, “mostly on the Hacienda de Licay.” August 1918, *J. N. Rose & G. Rose 22398.*—Garden in Otavalo. Alt. 8500 feet. February 20, 1921, *W. Popenoe 1266.*—Baños, Tungurahua. Alt. 6500 feet. March 6, 1921, *W. Popenoe 1267.*—Provincia de Tungurahua, Valley of Pastaza River. Between Baños and Cashurco. Alt. 1300–1800 m. September 25, 1923, *A. S. Hitchcock 21787.*—Provincia de Tungurahua, between Hacienda San Francisco and Río Margaritas, alt. 1225 m. March 20, 1939, *C. W. Penland & R. H. Summers 168.*—Provincia de Pichincha, Valley of Río Saloya, Los Paysanes. Alt. 1400 m. June 28, 1939, *E. Asplund 7298.*—Provincia de Imbabura, above García Morena. “Common at edges of clearings. Alt. 4200 feet. Suffrutescent herb, to 2 meters. Corollas whitish to pale magenta. *Naranjilla.*” August 9, 1944, *W. B. Drew E-531.*

PERU: “38. 786—*Solanum*. Planta culta in Hort. Oppido la Magdalena. *Solanum.*” No collector, no date. [Possibly same collection as following.]—“Ex oppida La Magdalena in Peruvia. Habitat in Limae hortic. Floret. Jun. Julio, Anoto et Sept. Fructus valde odorus. Vulgo *Naranjas de Quito*. Naturales Limae exprimunt aliquot guttas huju fructu in potum (vulgo *maté*) protectorem sauvem. Vulgo *Naranjitas de Quito.*” August 1782, *H. Ruiz & Pavón s.n.*—“Lima Hort.” 1778, *H. Ruiz & Pavón s.n.*—“Maynas,” 1831. *Poeppig 2222.*—“Chacapoyas, Perú.” No date. *Matthews s.n.*

COUNTRY UNKNOWN: “Ex hb. de Jussieu No. 6458.”—“Ex hb. Lamark.”—“Ex hb. De Candolle.” [Apparently a Pavón specimen.]

Solanum quitoense* Lamarck var. *septentrionale
R. E. Schultes & J. Cuatrecasas var. nov.

Haec varietas a *Solano quitoensi* principaliter ramis, petiolis foliorum superficiebus superioribus et inferioribus in nervis spinosis spinulosisque differt.

COLOMBIA: Departamento de Antioquia, no date, *Jervisse sn.*—Departamento del Tolima, Ibagué. 1844. *J. Goudot s.n.*—Departamento del Valle de Cauca, La Paila, April 1853, *Holton 23.*—Departamento Norte de Santander, near Ocaña. “Bush, open spaces. Alt. 8,500'. Shrub or small tree, 10–19', slender growth stems with thorns; flowers whitish, calyx and leaf with long, dark violet velvet, latter $1\frac{1}{2}$ –2' broad and $2\frac{1}{2}$ –3' long; fruit yellow with prickles, plum-shaped, edible, sour.” January 1878, *Kalbreyer 543.*—Departamento de Santa Marta, [Santa Marta mountain], alt. 6,000 ft. January 1903, *H. H. Smith 1853.*—Departamento de Cundinamarca, cercanías de San Bernardo hacia Sasaima, alt. 1600–1800 m. “Matotales y cafetales. Gran hierba de tallo grueso y aquifolioso; cálices algo violáceos, corola blanca o blanco-violácea.” June 23, 1940, *J. Cuatrecasas 9604.*—Departamento de Antioquia, Itaquí, July 1944, *Br. Daniel 3352.*—Departamento de Antioquia, alrededores de Medellín, Río Negro, alt. 1,560 m. “*Lulo*. Cultivated,” February 11, 1946, *W. H. Hodge 6712.*—Departamento del Valle, Cordillera Occidental, vertiente oriental, Quebrada del Tigre, Quebradita de Pultabrava, alt. 1,440 m. “Hierba muy robusta, 1 m. alt. Hoja blanda rigida, verde oscura haz, violeta envés. Hoja tierna violeta, ramos id. Cáliz violeta. Corola blanca o blanco violácea. Anteras amarillas. Fruto 5 cm. diámetro.” October 28, 1946, *J. Cuatrecasas 22694.*—Departamento del Valle, Cordillera Occidental, vertiente occidental, hoyo del Río Digua, Río San Juan, abajo de Queremal a la derecha del río entre km. 52 y 53, alt. 1,300–1,500 m. “Hierba robusta. Hoja muy blanda, envés y pecíolo violeta. Haz verde, oscuro. Cáliz violeta claro. Corola exteriormente violeta claro, interiormente blanca. Anteras amarillo claras. Fruto maduro amarillento, sabroso—5 cm. diám., hirsuto. *Lulo morado.*” March 19, 1947, *J. Cuatrecasas 23853.*—Departamento del Valle, Cordillera Occidental, vertiente occidental, hoyo del Río Digua, lado derecho, entre Queremal y La Elsa, alt. 1,200–1,160 m. “Hierba robusta, 1 m. o más. Hoja verde oscura haz, verde clara envés. Pecíolo verde pálido (verdoso blanquecino). Cáliz verdoso blanquecino. Corola blanca con ligero tono lila. Anteras amarillas. Frutos amarillo-anaranjados (maduros), 4.5 cm. diám., cubiertos de pelusa patente y punzante. Pulpa acidula, muy sabrosa. *Lulo.*” March 27, 1947, *J. Cuatrecasas 23992.*—Departamento del Valle, Cordillera Occidental, vertiente occidental, hoyo del Río Digua, lado izquierdo, Piedra

de Moler. Bosques, 1050 m. alt. "Hierba muy robusta y ramificada. Hojas blanquecinas. Corola blanca. Anteras amarillas. Bayas 4 cm. diám., amarillo-anaranjadas, erizadas. *Lulo de perro*." August 19-28, 1943, *J. Cuatrecasas 15031*.

ECUADOR: "Ad radices M. Chimborazo, alt. 2,300'. Suffrutex 5-pedalis." June 1860, *R. Spruce s.n.*

VENEZUELA: Colonia Tovar, 1854-55, *A. Fendler 1001*.—Same locality and date, *A. Fendler 1002*.—Same locality and date, *W. Sontar s.n.*—Caracas, neighborhood of Guaranas. Alt. 3,000 ft. "Flowers blue, fruit without prickles, small, veined, tall shrubby plants." December 1854, *Birschel s.n.* (K).—"Habitat ad Orinocum, prope Carichana." No collector, no date [ex "hb. Bonpland"].

Our studies lead us to the conclusion that typical *Solanum quitoense* is confined to the southern part of the range of the species complex and occurs in Perú, Ecuador (where it appears to be most abundant) and southern Colombia. This concept is easily recognized because it is completely devoid of spines along the branches, petioles and veins. It is deeply significant, we feel, that all of the collections from this southern periphery, with one exception, have not the slightest trace of spines. In other respects (such as color and density of indumentum on the leaves) they are also rather homogeneous. The collection *Spruce s.n.*, from the base of Mt. Chimborazo, is the single exception; it has slight and very remote spines, and the Kew specimen is annotated as representing one of the types of *Solanum*, the fruit of which is gathered for food in Ecuador. It may well represent a distinct variant, but paucity of material precludes a more precise disposition.

Herbarium material from the northern periphery—most of Colombia and part of Venezuela—is, without a single exception, spiny. There is tremendous variation in the abundance and size of the spines which are borne along the branches, on the petioles and along the nerves of the upper and lower surface of the leaves. Some speci-

mens have very small and remotely placed spinules; the other extreme has stout spines up to 10 or 12 mm. in length. *Cuatrecasas 23992*, from the Río Dígua, is almost devoid of spines, whereas *Cuatrecasas 15031*, from the same area, is well armed on the petioles and leaves with spines up to more than 1 cm. in length. *Hodge 6712*, from Antioquia, has remote but strong spines along the petioles and the midrib and, occasionally, even on the tertiary veins. The collection *Cuatrecasas 9604*, from Cundinamarca, has stouter spines, even on the upper surface of the leaves. If we can judge from the admittedly limited material at hand, we may suggest that there is evident a perceptible increase in density and size of spines as one proceeds northwards. Some of the material from Cauca is only weakly armed; the stoutest armature is found on specimens from the central and northern Andes of Colombia and Venezuela. Collections from intermediate regions, such as *Cuatrecasas 22694*, from the Departamento del Valle, would seem to be links between *Solanum quitoense* and its var. *septentrionale*.

The recognized fact that the density and size of the spines vary so much does not, we feel, argue against the separation as a distinct variety of the spiny from the unarmed variants. The genus *Solanum* tends to be extremely variable in respect to spines *where they occur*. There is a very distinct possibility that, when ample material is available for study and when adequate field studies have been carried out, the variation in color and density of the soft indumentum of the leaves may also be found to be sufficiently important to use in the recognition of additional varieties. However, we cannot, at the present state of our knowledge, evaluate the characters which may reside in the differences of leaf pilosity in the *Solanum quitoense* complex.

We have chosen the varietal epithet *septentrionale* to

indicate our belief that the spiny material represents a northern variant of *Solanum quitoense*.

In the Mutis collection of water-colors of Colombian plants, executed between 1783 and 1808 and preserved in the Jardín Botánico in Madrid, the two concepts *Solanum quitoense* and *S. quitoense* var. *septentrionale* are clearly distinguishable. Plate 38 in volume 19 consists of two double-sized black and white sheets, one depicting a flowering branch with a floral dissection, one with a fruiting stem and a dissected fruit; this is the spineless *Solanum quitoense*. Plate 39, representing *Solanum quitoense* var. *septentrionale*, has one sheet showing, in colors, a leafy branch in flower and one piece of stem in fruit; the stems, petioles and veins on the under surface of the leaf are armed with heavy spines and the flowers are larger than those shown in plate 38.

There is a large colored plate of *Solanum quitoense* (C. M. Curtis del.) in the De Candolle herbarium in Geneva. It is annotated as follows: “*Solanum angulatum*. Imported from Peru in 1824, by Robert Barclay. Bury Hill”; and in De Candolle’s hand: “Gravure donnée par M. Barclay. Ne fait partie d’aucun ouvrage. A. DC. 1839.”

The most extensive field notes found on an herbarium collection are preserved on the specimen of *J. V. Sigvald Muller s.n.* at Kew. Because of their completeness, we hereby publish them almost in full:

. . . the plant is, as you no doubt know, a climber, the fruit bright orange, nearly round or spheroid, about $1\frac{3}{4}$ inch to 2 inches in diameter. The pulp is bright green, very juicy and very aromatic. The seeds are mixed with the pulp when ripe The seeds are fixed to a softer body, than what I describe as solid white, but this solid part gets broken up in the pulp (and is eaten as well) when the pulp is squeezed out. The pulp looks like the pulp from green gooseberries; it is eaten with a little sugar. Is exceedingly pleasant and cooling. With cream it must be a delicious dish. The sugar is mixed with the pulp to taste. The pulp alone is not more acid than to make it pleas-

EXPLANATION OF THE ILLUSTRATION

PLATE XVII. Flower and young fruit of the type
plant of *Solanum quitoense* var. *septentrionale*.

Photograph by J. CUATRECASAS

PLATE XVII

